Requirements Engineering and Program Synthesis: Mutually Exclusive or Synergistic?

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Abstract

There has often been a clash within the formal methods community between early life-cycle proponents such as the requirements engineering community and late life-cycle proponents such as the program synthesis community. This talk will first characterize these positions and their underlying assumptions, and then expose a common set of problems and approaches. The talk will then propose an integrated life-cycle framework, and expound on its potential benefits. Technical challenges to achieving this integrated life-cycle framework will be described, as well as some preliminary work towards that goal.

About the Speaker

Michael Lowry *received his BS/MS from MIT, and his PhD from Stanford University in 1989, all in computer science. His PhD thesis work focused on problem reformulation: automated abstraction of a problem specified in an application domain to an algebraic domain, and then reformulation to a software engineering implementation domain for algorithm and data structure refinement. He joined the Kestrel Institute in 1989, and in the same year edited the book Automating Software Design by MIT/AAAI press. Subsequently he was invited by NASA Ames to start a research group in the area of automation of software engineering. The efforts of the group initially focused on developing practical program synthesis technology through automated reasoning. Amphion/NAIF demonstrated that deductive synthesis technology could generate programs in the domain of space observation geometries. Subsequent research extended this to the avionics domain and the data analysis domain. In developing all of these program synthesis systems, domain engineering has been the dominant labor-intensive cost.*

The Meta-Amphion project was initiated to develop technology to aid manual domain engineering for program synthesis systems. A paper describing preliminary results won the best paper award at the Knowledge-Based Software Engineering Conference in 1995. Many of the research issues that inspired this work are still outstanding. In the mid-nineties the group expanded its research scope to include verification and validation technology. It also formed collaborations with other institutions such as the NASA IV&V center to investigate the full range of V&V issues from the requirements level through to the implementation level. As with program synthesis, domain modeling plays a crucial role in verification of software systems. Current research includes tools and methods to model the environment of a software system for software model-checking V&V.

Dr. Lowry is a member of the editorial board for the Journal of Automated Software Engineering (published by Kluwer), and was the program chair of the IEEE Automated Software Engineering conference held in fall 1997 (formerly the KBSE conference). He was the principle author of a tutorial on knowledge-based software engineering that was part of the Handbook of Artificial Intelligence. Lowry has chaired workshops sponsored by AAAI on AI and Software Engineering, as well as workshops on problem reformulation, and served on numerous conference program committees.

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